

# Local Guideline and Procedure



John Hunter  
Children's Hospital  
CHILDREN, YOUNG PEOPLE AND FAMILIES



Health  
Hunter New England  
Local Health District

## CLINICAL APPLICATION OF HAMILTON-RUSSELL TRACTION

<b>Sites where Local Guideline and Procedure applies</b>	John Hunter Children's Hospital
<b>This Local Guideline and Procedure applies to:</b>	
1. Adults	No
2. Children up to 16 years	Yes
3. Neonates – less than 29 days	Yes
<b>Target audience</b>	Clinical staff applying and providing care to paediatric patients in Hamilton-Russell traction
<b>Description</b>	Provides information to clinicians for care of a child/infant requiring Hamilton-Russell traction

[Go to Procedure](#)

<b>National Standards</b>	NS 1, 2, 3, 6.
<b>Keywords</b>	Traction, Hamilton-Russell, lower limb, paediatric orthopaedics, fractured femur
<b>Document registration number</b>	JHCH 10.3
<b>Replaces existing document?</b>	JHCH 10.3 - 2017

**Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics:**

- [NSW Health Policy Directive 2017\\_032 Clinical Procedure Safety](#)
- [NSW Health Policy Directive PD 2017\\_013 Infection Prevention and Control Policy](#)
- [HNELHD PD2019\\_020\\_PCP\\_1\\_Clinical\\_Handover - ISBAR.pdf](#)
- [NSW Health Policy IB2020\\_010 Consent to Medical and Health Care Treatment Manual .pdf](#)

<b>Local Procedure note</b>	This document reflects what is currently regarded as safe and appropriate practice. The procedure section does not replace the need for the application of clinical judgment in respect to each individual patient but the procedure requires mandatory compliance. If staff believe that the procedure should not apply in a particular clinical situation they must seek advice from their unit manager/delegate and document the variance in the patient's health record.
<b>Position responsible for the Local Procedure and authorised by</b>	JHCH Quality Safety & Patient Care Committee
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Note: Over time links in this document may cease working. Where this occurs please source the document in the PPG Directory at: <http://ppg.hne.health.nsw.gov.au/>

## PURPOSE AND RISKS

This local clinical procedure and procedure has been developed to provide instruction to the health clinician and to ensure that the risks of harm to the child associated with application of traction are prevented, identified and managed.

The risks are:

- Ineffective traction
- Neurovascular damage
- Skin damage

The risks are minimized by:

- Clinicians having knowledge of fractured femur management and traction management
- Clinicians seeking assistance if the therapy is outside their scope of practice
- Following the instructions set out in the clinical protocol
- Recognition of the common clinical signs of the risks with neurovascular assessment
- Rectification of the causes of the risks to the patient

**Please refer to the problem solving table PAGE 18 for further instruction**

**Risk Category:** Clinical Care & Patient Safety

## GLOSSARY

Acronym or Term	Definition
Counter-traction	A force that is opposing the traction force, which creates a pull on the limb
Footplate	A square plastic spreader that sits below the bottom of the patient's foot when in skin traction
Fracture	A complete or incomplete break in a bone resulting from force
Hydrocolloid	A malleable adhesive skin dressing applied with the intention of protecting the skin under the skin traction
Ischaemia	Insufficient blood supply to a part of a body due to a mechanical obstruction
Pulley	A device that is designed to allow rope to move freely through it in a desired direction
Skin shearing	A separation between layers of skin resulting from opposing forces
Skin traction	Traction that is applied via adhesive tape applied on the skin
Sling	A soft material that is placed under the knee to lift the leg while in traction
Spreader bar	A metal 'coat-hanger' shaped bar that holds the sling in place under the knee and attaches to the traction rope
Traction	A pulling force on an extremity designed to achieve a desired therapeutic outcome
Traction frame	A frame that supports pulleys and rope for traction
Weight bag	A weighted bag that provides a specified amount of pull on the skin traction device

## PROCEDURE

This Procedure does not replace the need for the application of clinical judgment in respect to each individual patient. More comprehensive information is available in the learning resource available on the ward share drive.

## INDICATIONS AND BENEFITS OF HAMILTON-RUSSELL TRACTION

- Achieve and maintain femoral fracture alignment in children and young people who weigh more than 12kg
- Decrease and prevent muscle spasm
- Analgesia

## PREPARATION

It is mandatory to ensure that the parents / carers have received appropriate information to provide informed consent. Patient identification, correct procedure and correct site process must be completed prior to any procedure.

### PRIOR TO APPLICATION

- Prepare the child for the procedure in a developmentally appropriate manner. Plans should be individualised to suit the child in consultation with parents/carers
- It is strongly advised that a child life therapist is called if the procedure occurs during regular business hours
- Assess the child's skin integrity and skin history, i.e., eczema
- Perform and document a neurovascular assessment
- Ensure all the equipment is available BEFORE administration of analgesia

### ANALGESIA MANAGEMENT

- The child should be calm, relaxed and free of pain prior to the procedure
- A definitive analgesia plan must be in place before any physical contact affecting the fracture site is initiated
- A femoral nerve block and Nurse Controlled Analgesia, containing opioid, are recommended
- It is recommended the Acute Pain Service is contacted

**Where a nerve block and / or opioid analgesia are contra-indicated in the acute phase of injury, the reason must be clearly documented in the child / young person's notes with an alternate analgesia plan.**

### PARENT PREPARATION

- Parents and child / young person, where appropriate, should have an initial treatment plan explained to them.
- Parents should be given the "A Carer's Guide to Hamilton-Russell traction" booklet available on the JHCH ward share drives.

- It is recommended the parents/carer be included in the procedure and be given a role, such as distraction and comfort. This should be clearly defined prior to the procedure.

## STAFF PREPARATION

- It is mandatory for staff to follow relevant: “Five moments of hand hygiene”, infection control, moving safely/safe manual handling, and documentation practices.

## PRESCRIBING TRACTION

- Traction must be prescribed in the notes by a medical officer.
- The traction and management plan must be written in a clear and unambiguous manner.
- Use metric, not imperial weight measurements, ie, kg not lb.

## APPLYING TRACTION

- Traction is a medical therapy. It must be applied by knowledgeable and competent clinical staff. A minimum of two clinicians are required for traction application.
- Ensure the procedure is followed. The accuracy with which the traction is applied will determine its effectiveness.
- Determine clinician competence. Locate an experienced staff member if necessary. It is recommended traction is applied by clinicians who are experienced with traction application or at least under instruction from an experienced clinician.
- The procedure will take approximately 45 minutes.

## EQUIPMENT

General	Patient	Set-up
Alcohol based hand rub	Hydrocolloid – thin version for placement under skin traction	1 x water bag (not IV or sand bag)
Personal protective equipment	1 x adult or paediatric traction kit Adult kits are suitable for children >3yrs (approximately) If the child’s foot is wider than the foot plastic footplate in the paediatric kit, the child should be placed in an adult kit	White sticker for water bag for record the weight
Non-sterile scissors		Electronic scales
Tape		Tap water
		1 x small pulley
		1 x spreader bar
		1 x sheepskin sling
		1 x roll traction rope

		<p>Electric bed with Hamilton-Russell frame – found in corridor outside J1, Contact Orthopaedic CNC if all beds in use (see Figure 11)</p>
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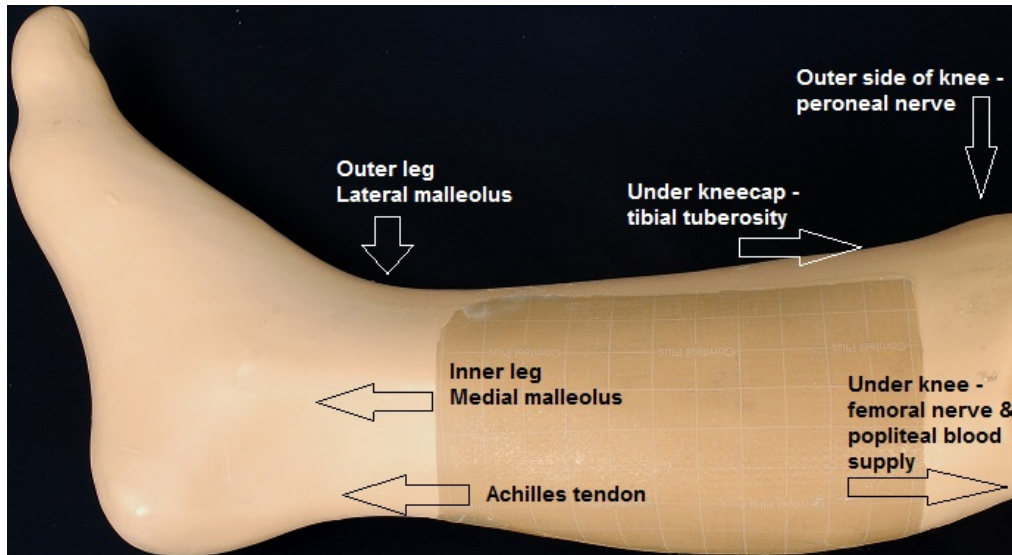


Figure 1. Equipment required for traction application.

## PROCEDURE

### BE AWARE OF POTENTIAL RISK FACTORS

The arrows highlight areas at risk of damage from traction therapy. Constant force and pressure can damage nerves, expose tendons, cause pressure areas over bone and restrict blood flow to the limb.



**Figure 2.** Arrows identify the areas that are at risk of damage from pressure and force.

### PROTECTIVE DRESSINGS

Cut and place a hydrocolloid dressing on either side of the child's lower legs. This will protect the skin from the adhesive tape in the traction kit. It also distributes the force over the skin surface.



**Figure 3.** Hydrocolloid dressings are placed on either side of both legs to protect the skin.

## PROCEDURAL STEPS

### Traction tape

- The foot plate should be half a hand space from the end of the foot.
- The tape should be 1cm above the ankles and 1cm below the knee.
- Measure and cut before removing the backing paper from the tape.
- The skin traction should not be stuck to skin above the knee or below the ankles.
- Ensure the tape has no wrinkles.

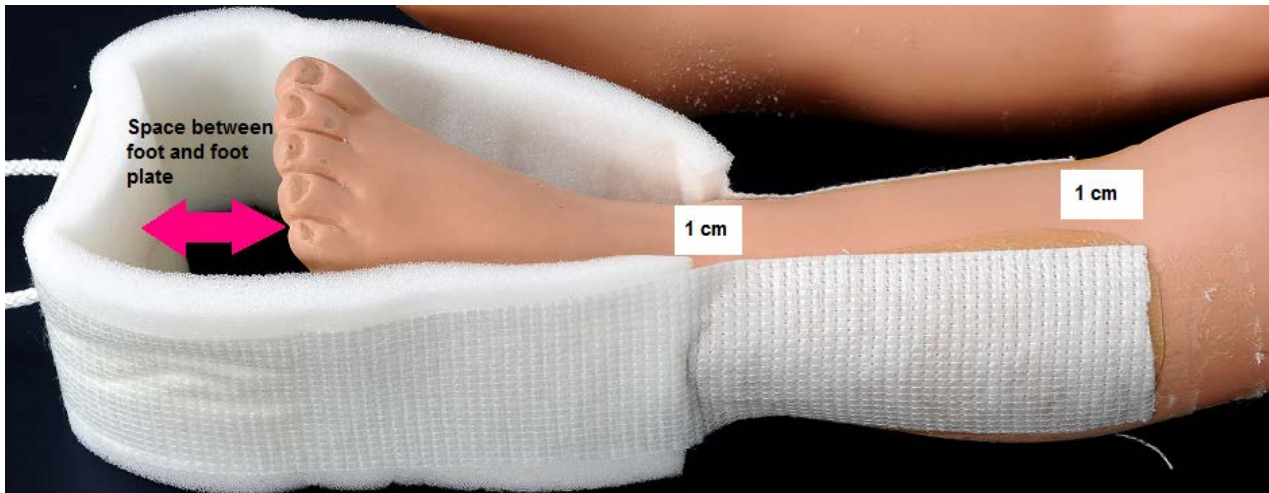


Figure 4. Measuring and applying the skin traction.

- Wrap the bandage around the leg firmly, not tight.
- Secure the bandage with tape. Do not place tape circumferentially around the child's leg.
- Put a pulley onto the rope at the end of the footplate and tie a secure knot.
- Cut the rope.



Figure 5. Attach the pulley to the foot.

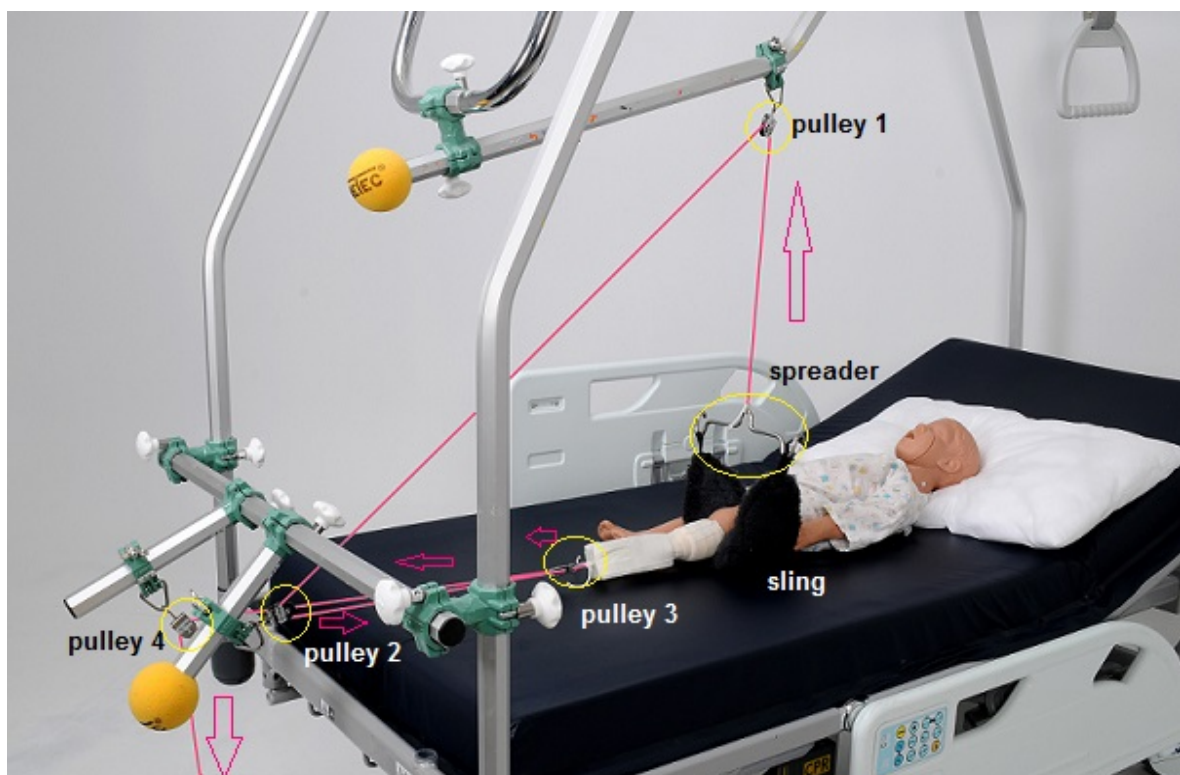


- Measure and cut a piece of rope (approx. 3.5m) and tie one end to spreader bar.
- Place the sling under the knee.
- Ensure the sling does not place pressure on the popliteal fossa (blood supply running down the back of the knee). This can be avoided by placing the sling slightly closer to the femur (proximally).
- Attach the spreader bar and rope to the sling.



Figure 6. Positioning the sling and spreader bar.

- Position **pulley 1** directly above the patient's knee and thread the free end of the rope through the pulley
- Thread the rope through **pulley 2** at the foot of the bed
- Thread the rope through **pulley 3** at the patient's foot
- Thread the rope through **pulley 4** at the end of the bed
- The rope system should look like a triangle with a double line on the base



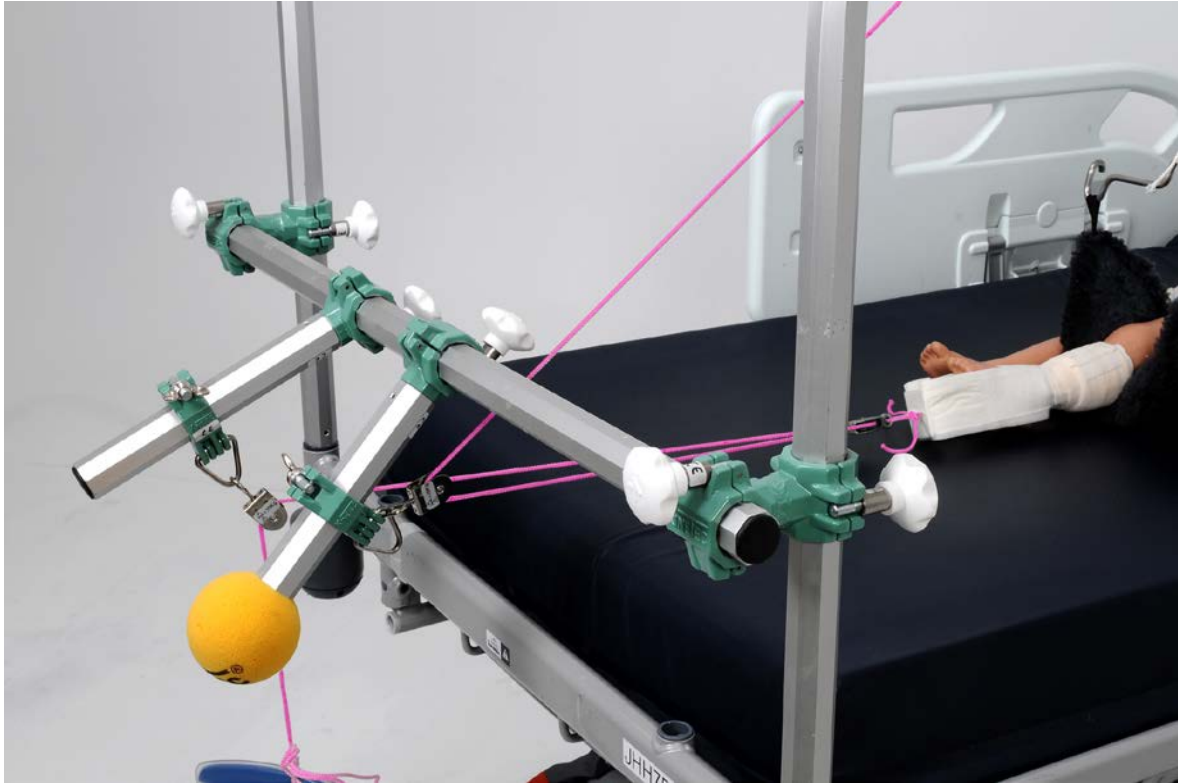


Figure 7 & 8. Threading the rope through the pulleys.

## APPLYING THE WEIGHT

The amount of weight applied to a limb is very important. The weight should be between 5-10% of the child's weight. For example, if the child weighs 12kg, the weight should be between 600g-1.2kg depending on the build and muscle tone of the child.

- too little weight is ineffective
- too much weight will cause skin and tissue damage

**Weight in excess of 10% will cause skin shearing within weeks.**

**Weight in excess of 20% will cause neurovascular compromise to the limb within days and eventually, ischaemia.**

- Use baby scales to weigh the water bag.
- Write the weight and date on a sticker and attach to the bag.
- Change the weight over gently, steady and gradually or the patient's quadriceps will go into spasm (which is extremely painful).
- Attach the prescribed weight.
- The weight may be adjusted several times during the first week. Ensure the knot can be undone easily.



Figure 10. Labelling the weight bag.

## SKIN SHEARING

In the picture below, you can see how the tape has pulled the skin towards the weight and has separated the top layers of skin from the lower layers. This is called skin shearing.

Skin breakdown is a problem for children requiring traction therapy because after shearing has occurred:

- The weight must be reduced to prevent further skin breakdown
- The surface area of the skin traction should be increased (by adding a larger piece of thin hydrocolloid under the skin traction)
- The child will not be able to be placed in a plaster
- It could prevent a child from having surgery



Figure 9. Skin shearing caused by excessive, continuous weight on the skin.

## AFTER APPLICATION

### COUNTER-TRACTION

The patient's body is the counterweight to the weight placed on the limb. Without counter-traction the patient may experience muscle spasm, mal-alignment of bones and they will slide out the end of the bed.

The amount of counter-traction required is whatever is needed to stop the patient sliding down the bed. Once the weight is applied, the child may feel some initial discomfort. This should be temporary.

- The patient's hip should be slightly flexed ( $20^{\circ}$ ).
- The knee should be slightly flexed ( $10-20^{\circ}$ ).
- The calf and heel should be slightly elevated off the bed (sometimes this cannot be achieved).



Figure 11. The completed Hamilton-Russell traction set-up.

### SPASMS

Sometimes the quadriceps muscle can go into strong spasm, which is very painful. If this occurs, prn medication and some steady, extra manual traction is recommended (this is not to be performed by novice staff) until the spasm decreases.

If the child is still unsettled after medication and manual traction, assess the child, complete a pain assessment and review traction. If no problem can be identified - initiate a clinical review.

**ANTI-ROTATION FOAM GUTTER:**

*Call the occupational therapist and ask for an anti-rotation foam gutter to be made for the patient (this is to prevent the foot from turning out – external rotation). This must be done within 7 days of admission to prevent external rotation of the limb.*



Figures 12 & 13. Show how the leg should be positioned in the foam gutter with toes pointing up.

## MAINTENANCE

### SITTING UP IN BED

The hip joint is able to be flexed without affecting the alignment of the femur in most circumstances. The purpose of having a system where rope can slide through pulleys, is to give the patient some reasonable mobility in the bed.

The child should not be allowed to lie flat or have their heads tilted down for long periods, especially when eating. Unless the team has expressed otherwise – **all children may sit up in bed as pain permits**. Parents should not be told their children cannot sit up.

At the beginning of every shift, the nurse allocated to the child must check the traction is correctly set up. It is not acceptable to assume the traction was correct on the previous shift:

- Check the traction thoroughly
- Make necessary adjustments and changes
- Perform a complete neurovascular assessment

### **NOTE: NO COUNTER-TRACTION = INEFFECTIVE TRACTION**

Traction must be continuously maintained for the duration of treatment and may not be removed without instructions from the treating team.

- If the child's skin integrity deteriorates, clinical review is required
- Do not place talc, cream, oil or moisturiser on the affected leg unless it is prescribed on the patient's medication chart

### REMOVAL

- Care must be taken when removing adhesive products from skin.
- Take care if using commercial adhesive removal products. Check for broken skin.
- Warm soapy water can be used.
- A warm bath/shower is suggested to remove tape once treatment has been completed.

## SUMMARY

1. The child's neurovascular status has been checked and is satisfactory
  - There are no signs and symptoms of neurovascular compromise, or a clinical review has been initiated and the cause has been rectified
  - The skin under the tapes is intact
2. The weight has been checked with electronic scales
  - The weight bag is labelled and dated
  - The weight is equal to or less than 10% of the child's weight up to a maximum of 2.2kg
3. Counter-traction has been applied
  - The weight is off the floor
  - The child is not sliding down the bed
4. The child is lying in bed in correct alignment with the traction
  - The traction is set-up correctly
5. The child and parents are aware the child may sit up as tolerated
6. The child has a pain score less than or equal to 3/10 using an appropriate paediatric pain scoring tool
  - The child is interactive and is moving without distress
  - The child is interactive and does not become easily distressed when staff approach
  - The child is having simple regular analgesia and PRN opioid analgesia prior to personal care, pressure area care or painful procedures
7. The child is eating and drinking
8. The child has had their bowels open within 2 days
  - The child has laxatives charted
9. The child has an anti-rotation foam gutter placed under their lower leg to control external rotation within 7 days of admission
10. The child and family have had appropriate referrals to allied health staff, which may include:
  - Occupational therapy
  - Physiotherapy
  - Social work
  - Psychology
  - Child life therapy
  - Dietician

**PROBLEM SOLUTION CHECKLIST**

PROBLEM	WHAT IS THE GOAL FOR THE CHILD?	WHAT ARE YOU GOING TO DO ABOUT THE PROBLEM?	HOW ARE YOU GOING TO ASSESS IF YOUR INTERVENTION HAS BEEN SUCCESSFUL?
<p><b>The extremity is swollen</b></p>	<ul style="list-style-type: none"> <li>Maintain neurovascular circulation</li> <li>Reduce or prevent swelling</li> </ul> <p><i>*IV therapy should not be running through an affected limb unless there is no alternative option – where this occurs, staff need to be aware of the extra risks of neurovascular compromise and not assume the IV therapy is the cause of neurovascular changes</i></p>	<ul style="list-style-type: none"> <li>Encourage movement of the distal joint (where appropriate)</li> <li>Check for and release restrictive materials down to the level of the skin</li> <li>Check the traction weight is less than or equal to 10% of the child’s body weight (up to a maximum weight of 2.2kg)</li> <li>Instigate a clinical review within 30 minutes</li> <li>Increase the frequency of neurovascular assessment according to the recommendation in the protocol</li> </ul>	<ul style="list-style-type: none"> <li>Corrective intervention has been initiated</li> <li>The swelling has been reduced</li> </ul>
<p><b>Skin integrity is impaired</b></p>	<ul style="list-style-type: none"> <li>Reduce the risk of further damage to the skin</li> <li>Give the skin an environment that promotes healing</li> <li>Remove the cause of the damage to the skin (see next column)</li> <li>Maintain effective traction</li> </ul>	<ul style="list-style-type: none"> <li>Request a clinical review within 2 hours</li> <li>Increase the surface area of the skin traction</li> <li>Reduce the weight of the traction (after consultation with CNC or MO)</li> <li>Apply an appropriate dressing (a thin hydrocolloid is usually appropriate)</li> <li>Take care not to cause further damage when removing adhesive from broken skin</li> </ul>	<ul style="list-style-type: none"> <li>Further damage to skin is prevented</li> <li>Skin is healing or has healed</li> <li>Traction has been maintained</li> <li>Damaged skin has been documented with clinical photography</li> </ul>
<p><b>Constipation</b></p>	<ul style="list-style-type: none"> <li>Constipation is prevented and/or treated</li> </ul> <p><i>*please note the effects of slowed bowel motility if patient is having opioid analgesia</i></p>	<ul style="list-style-type: none"> <li>Document bowel activity daily</li> <li>Ensure laxatives are charted</li> <li>Encourage fluid intake</li> </ul>	<ul style="list-style-type: none"> <li>Bowel activity is usual for the child</li> </ul>



<p><b>Ineffective and/or inadequate analgesia</b></p>	<ul style="list-style-type: none"> <li>The child is assessed for pain using an appropriate paediatric pain assessment tool and is treated according to the paediatric pain procedure</li> </ul>	<ul style="list-style-type: none"> <li>Use a paediatric pain scoring tool to assess the child's pain and document the assessment</li> <li>Administer appropriate and effective analgesia</li> <li>Check counter-traction</li> <li>Check for occult sources of pain</li> <li>Re-assess regularly</li> <li>Request clinical review within 30 minutes</li> <li>Complete IMS+ report (if appropriate)</li> </ul>	<ul style="list-style-type: none"> <li>The child's has an appropriate and definitive pain management plan and the pain is effectively controlled</li> <li>The child has a pain score &lt;3</li> <li>Staff and family are able to perform care</li> </ul>
<p><b>Increased pain after traction application / re-application</b></p>	<ul style="list-style-type: none"> <li>The source of the pain is discovered and clinical intervention initiated</li> </ul> <p><i>*Ineffective traction can cause pain</i></p>	<ul style="list-style-type: none"> <li>Check the amount of weight is appropriate (less than or equal to 10% of the child's body weight)</li> <li>The traction weight does not exceed 2.2kg</li> <li>Check that the traction is correctly applied – there is counter-traction</li> <li>Check the rope is not caught in a pulley</li> <li>Pain assessment</li> <li>Request a clinical review within 30 minutes</li> </ul>	<ul style="list-style-type: none"> <li>The source of the pain is discovered and clinical intervention has been successful</li> </ul>
<p><b>Traction is applied incorrectly</b></p>	<ul style="list-style-type: none"> <li>The traction is re-applied correctly</li> </ul>	<ul style="list-style-type: none"> <li>Refer to the Hamilton-Russell procedure</li> <li>Request a clinical review if not able to re-apply the traction correctly</li> <li>Complete IMS+ documentation</li> </ul>	<ul style="list-style-type: none"> <li>The traction has been correctly applied and is effective</li> </ul>
<p><b>The traction is falling off or not adhering to the leg</b></p>	<ul style="list-style-type: none"> <li>The skin is free of substances, ie, oils, talc, creams, that prevent the traction from adhering to the skin</li> </ul>	<ul style="list-style-type: none"> <li>Ensure the skin is dry, free of oils, talc and creams and free of shedding or flaky skin.</li> <li>Do not put cream or talc on the leg</li> <li>Is the traction kit an adult kit?</li> <li>Check /reduce the weight</li> <li>Increase the traction surface area</li> </ul>	<ul style="list-style-type: none"> <li>The traction is adhering to the skin and is effective</li> </ul>
<p><b>The child is moving and spinning around in the traction (this can be a sign of healing)</b></p>	<ul style="list-style-type: none"> <li>Maintain the traction and keep the child safe</li> </ul>	<ul style="list-style-type: none"> <li>Do not prevent the child from moving unless it is unsafe</li> <li>If supervision is not effective, the child can be placed into straight leg traction in a cot for the last week of therapy at the surgeon's discretion</li> </ul>	<ul style="list-style-type: none"> <li>The traction is effective and the child is safe</li> </ul>

<b>Child is sliding down the bed and the traction bag is constantly on the floor</b>	<ul style="list-style-type: none"> <li>Maintain effective traction</li> </ul>	<ul style="list-style-type: none"> <li>Ensure the bed end is elevated to provide counter-traction</li> <li>Check the linen for slide sheets</li> <li>Check the child is not on a pressure relieving mattress (they are covered in slippery fabric)</li> <li>Ensure the weight is not in excess of 10% of the child's body weight</li> <li>If a young person, check the traction does not exceed 2.2kg</li> <li>Reduce the traction weight</li> </ul>	<ul style="list-style-type: none"> <li>Effective traction is achieved and the child is not sliding down the bed</li> </ul>
<b>Pressure area behind the knee</b>	<ul style="list-style-type: none"> <li>Reduce the pressure under the knee and prevent further soft tissue damage</li> </ul>	<ul style="list-style-type: none"> <li>Ensure the traction has been set up correctly</li> <li>Ensure the rope is moving freely through the pulleys</li> <li>Ensure the position of the sling is correct – the sling should be positioned slightly proximally, ie, closer to the femur to avoid pressure on the popliteal fossa</li> <li>Increase the size of the sling under the knee for older patients</li> <li>Ensure the sling fabric is appropriate, avoid use of synthetic materials</li> <li>Increase neurovascular observations according to neurovascular assessment protocol</li> <li>Request a clinical review</li> <li>Request a clinical review within 4 hours</li> </ul>	<ul style="list-style-type: none"> <li>The pressure under the knee has been reduce and further soft tissue damage is prevented</li> <li>The pressure area has been staged, documented in the notes and recorded with clinical photography</li> </ul>
<b>The child is moving and spinning around in the traction (this can be a sign of healing)</b>	<ul style="list-style-type: none"> <li>Maintain the traction and keep the child safe</li> </ul>	<ul style="list-style-type: none"> <li>Do not prevent the child from moving unless it is unsafe</li> <li>If supervision is not effective, the child can be placed into straight leg traction in a cot for the last week of therapy at the surgeon's discretion</li> </ul>	<ul style="list-style-type: none"> <li>The traction is effective and the child is safe</li> </ul>

## COMPLIANCE, IMPLEMENTATION AND MONITORING

The owners/developers of the document (Orthopaedic CNC) will:

1. Distribute the approved guideline to all relevant managers and clinical staff using email.
2. Distribution of a fact sheet
3. Provide JHCH clinical in-service highlighting any changes to clinical practice
4. Report on any IIMs received for this guideline and respond appropriately

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## APPENDICES

1. Application of Hamilton Russell Traction Flow Chart
2. Clinical Audit Tool

## FEEDBACK

Any feedback on this document should be sent to the Contact Officer listed on the front page.

## CONSULTATION

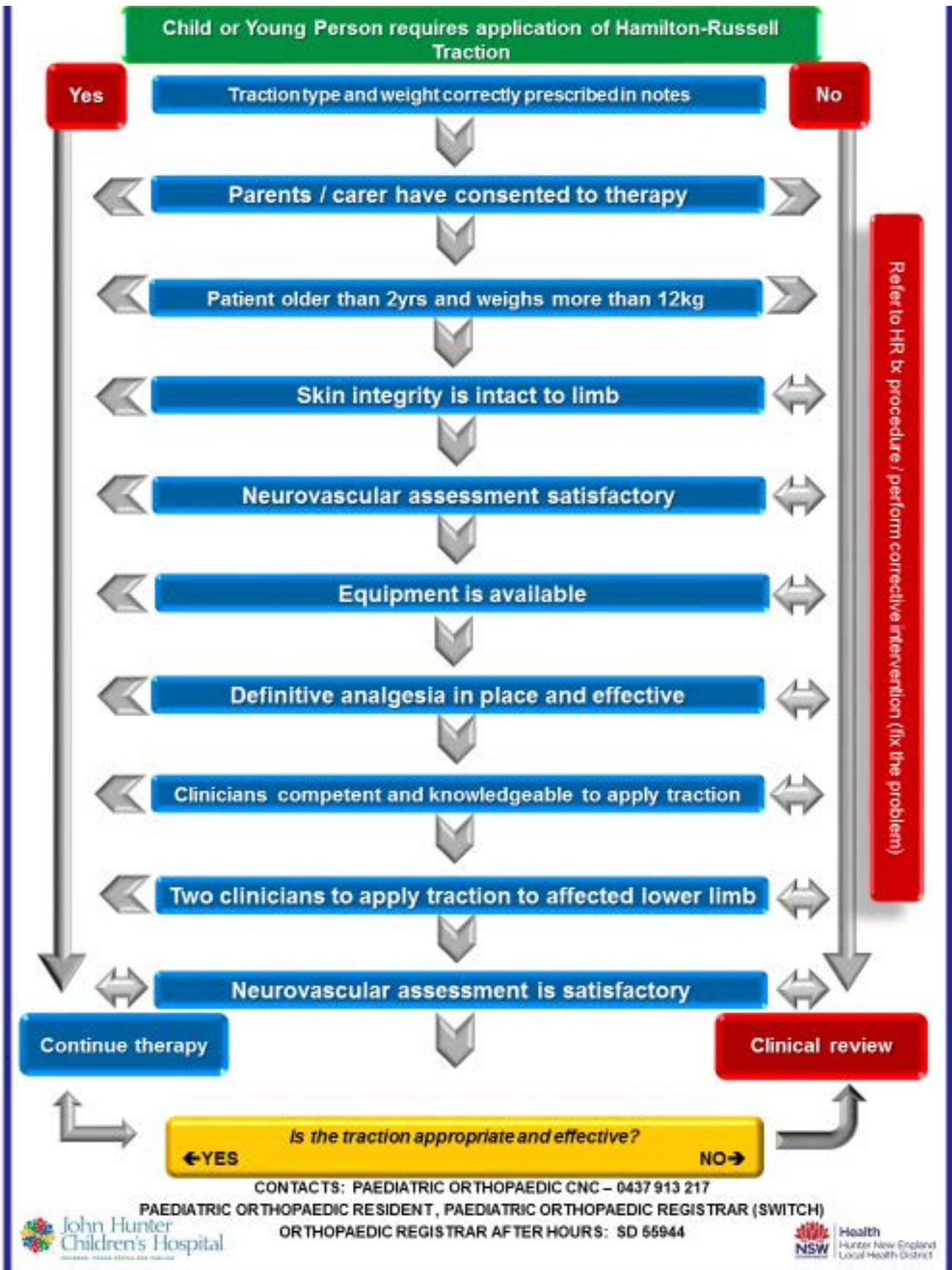
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Clinical Practice Guideline Advisory Committee	

## APPROVAL

CPGAG - April 2020  
JHCH CQ&PCC - 27<sup>th</sup> May 2020

**APPENDIX ONE - APPLICATION OF HAMILTON RUSSELL TRACTION FLOW CHART**

This procedure is a clinical therapy and requires mandatory compliance.



## APPENDIX TWO - CLINICAL AUDIT TOOL

(National Standard 1: 1.7.2 The use of agreed clinical guidelines by the clinical workforce is monitored)

Criterion no.	Criterion	Exceptions	Definition of terms and/or general guidance	Data source	Frequency	Position Responsible
1	Percentage of children in Hamilton-Russell traction who have not had the therapy applied as recommended by the protocol. All children in Hamilton-Russell traction will be audited, inclusive of consumer feedback	None	The aim is that all children undergoing Hamilton-Russell traction therapy receive the recommended standard treatment. (Standard = 100%)	Patient health record and consumer feedback	Constant	CNC Paediatric Orthopaedics
2	Quantity of IMS+ reporting		The aim is that the percentage of IMS+ will be reduced	IMS+	Constant	
3	Competency of clinicians who are able to apply, care for and provide information to others regarding care of the child in Hamilton-Russell traction	None	The aim is that all staff who apply, care for and provide information to others, have the minimum described standard of skill and knowledge	Audit staff	12 monthly	CNC Paediatric Orthopaedics

**Reference:** *Electronic audit tool - National Institute for Health and Clinical Excellence (NICE): [www.nice.org.uk/nicemedia/live/10996/56372/56372.xls](http://www.nice.org.uk/nicemedia/live/10996/56372/56372.xls)*